WHAT IS CLAIMED IS:

1. A synchronous electric machine having a rotor member and a stator member having a stator core, the electric machine comprising:

a main machine having a direct current (DC) rotor field winding mounted on the rotor member; and

a dual alternating current/direct current (AC/DC) excitation system for said synchronous machine comprising:

a rotatable polyphase armature winding in electrical communication with a rectifier assembly for conducting direct current to said rotor field winding;

a plurality of DC salient poles and at least one alternating current (AC) salient pole both included in the stator core, wherein respective AC salient poles of the at least one AC salient pole are disposed between adjacent DC salient poles of the plurality of DC salient poles;

at least one DC field winding, each DC field winding having at least one DC field coil disposed on at least one DC salient pole of the plurality of DC salient poles; and

at least one AC field winding, each AC field winding having at least one AC field coil disposed on at least one AC salient pole of the at least one AC salient pole, a magnetic axis of respective AC field coils being disposed substantially in electromagnetic space-quadrature relation with respect to magnetic axes of adjacent DC field coils, wherein when said respective AC field coils are energized, an alternating current is induced in said polyphase armature winding for providing excitation to said main machine.

2. The electric machine defined by claim 1, wherein said stator core is formed of magnetic laminations.

3. The electric machine defined by claim 1, wherein said stator core is formed of iron core.

4. The electric machine defined by claim 1, wherein a ratio of the size of the DC salient poles of the plurality of DC salient poles to the size of the AC salient poles of the at least one AC salient pole is selectable in accordance with application requirements for starting and running the main machine.

5. The electric machine defined by claim 1, further comprising:

a supplemental AC power supply for providing AC excitation to the at least one AC field winding and a means for providing DC input for providing DC excitation to the at least one DC field winding, wherein the supplemental AC power supply is controllably deactivated substantially when the means for providing DC input is activated.

6. An electric machine comprising:

a shaft;

a rotatable armature winding disposed on said shaft;

a stator member having a stator core, the stator core including a plurality of salient poles thereon concentrically disposed about and spaced apart from said armature winding, said plurality of salient poles including a plurality of direct current (DC) salient poles and at least one alternating current (AC) salient pole, wherein respective AC salient poles of the at least one AC salient pole are disposed between adjacent DC salient poles of the plurality of DC salient poles;

a DC field coil disposed on respective DC salient poles of the plurality of DC salient poles, said DC field coils being connected together to constitute a DC field winding; and

at least one AC field coil disposed respectively on said at least one AC salient pole, the magnetic axes of said at least one AC field coil being disposed substantially in electromagnetic space-quadrature relation with respect to the magnetic axes of said DC field coils; and

wherein energizing the AC or DC field coils provide excitation to the electric machine for rotating the shaft.

7. The electric machine defined by claim 6, wherein said stator core is formed of magnetic laminations.

8. The electric machine defined by claim 6, wherein said stator core is formed of iron core.

9. The electric machine defined by claim 6, wherein AC field coils of said at least one AC field coil are connected together to form at least one AC field winding.

10. The electric machine defined by claim 6, wherein a ratio of the size of the DC salient poles of the plurality of DC salient poles to the size of the AC salient poles of the at least one AC salient pole is selectable in accordance with application requirements for starting and running the electric machine.

11. The electric machine defined by claim 6, further including a supplemental AC power supply for providing AC excitation to the AC field winding and means for providing DC input for providing DC excitation to the DC field winding, wherein the supplemental AC power supply is controllably deactivated substantially when the means for providing DC input is activated.

12. A method of accelerating a rotor member of a synchronous machine from rest to a predetermined speed of rotation, said method comprising the step of:

exciting an alternating current (AC) winding of an excitation system of the machine with a single phase alternating current for magnetizing at least one AC salient pole supported on a stator of said machine, the at least one AC salient pole supporting the AC winding, where the polarity of the magnetized at least one AC

salient pole varies over time in accordance with the variation of the polarity of the single phase alternating current, for inducing alternating current within a rotor armature winding of the excitation system;

rectifying alternating current output by said rotor armature winding for providing direct current;

providing the direct current to a rotor field winding of a main machine of the machine for establishing a static magnetic field;

applying a polyphase alternating current to a stator armature winding of the main machine for establishing a dynamic, rotating magnetic field, where the phase relationship between the static magnetic field and the dynamic, rotating magnetic field causes application of a torque on the rotor member for causing rotation of the rotor member; and

continuously increasing the frequency of the applied polyphase alternating current until said rotor member has accelerated to said predetermined speed of rotation.